BAJOCIAN (MIDDLE JURASSIC) SECTIONS FROM THE NORTHERN BAKONY (HUNGARY)

by

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РЕЗЮМЕ

Речь идет о биостратиграфической интерпртации четырех профилей, относящихся к среднему юрскому периоду, находящихся в серевной части гор Баконь. Наиболее полная байоцская сория была обнаружена в залеже холма Локут. Аммонитовая фауна, состоящая из 16 000 образцов, и являющаяся основой разделения по зонам и субзонам, может быть рассмотрена как первостепенно важная с точки зрения медитерранской средней юры.

В остальных сильно прерывистых профилях было обнаружено намного меньше палеонтологических остатков, однако и они хорошо коррелировались с ранее иследованными и с локутскими образцами

На основании исследования фауны было найдено, что в профилях-байоц гор Баконь рамыми распоостраненными являются зоны Стефаносерас хумприесинум, а зоны нижнего и верхнего байоца часто отсутствуют.

Introduction

The Middle Jurassic of the Transdanubian Central Mountains, including the Bakony, have been reviewed recently in three comprehensive works. In his synthesis prepared for the Mesozoic Conference of Budapest N o s z k y jun. (1961) listed the localities, rock-types and presented the sequence of several occurences in profiles. V a d á s z (1960) in his book "The Geology of Hungary" summarized the available data about the Jurassic of the Transdanubian Central Mountains, and presented some faunal lists. In his account introduced on the Mediterranean Jurassic Colloquium in 1969, F ü l ö p (1971) dealt with the Middle Jurassic too, mainly from the point of view of microfaunistic studies.

On the basis of the above mentioned works and the faunas collected recently from some new localities, it is proved, that among the Middle Jurassic stages the Bajocian is the one represented by ammonite-bearing limestones on larger areas. The Aalenian is known from some localities (e.g. Csernye), and only a single occurence of the Bathonian ammonitic limestone facies (Gyenespuszta, G a l á c z 1970) have been found. In other places the Bathonian is known as radiolarite, containing microfauna exclusively. The Callovian of the Bakony Mountains developed in radiolaritic facies.

The detailed biostratigraphy of the Bajocian of the Bakony Mountains have been concerned in two works. In connection with the treating the Aalenian ammonites of Csernye, Géczy (1967a, b) proved – on the basis of a poor fauna – the presence of the Sonninia sowerbyi Zone. On the other hand, in the lower part of the Middle Jurassic section of Gyenespuszta a well dividable Middle and Upper Bajocian sequence have been known, with rich ammonite fauna (Galácz 1970).

During the years 1969–1973 the staff of the Geological Survey of Hungary collected the faunas of several Middle Jurassic sections in the Bakony Mountains. This extremely rich material, encountered through precise collection work, enables the more detailed cognition of the Bakony Mountains' Bajocian.

This present paper deals with the subdivisioning and parallelization of the Bajocian sections known previously from scattered references of the literature. The paleontological and more detailed stratigraphical results of the fauna consists of more than 17.000 ammonite specimens are the bases of subsequent publications.

The studied sections are situated in the Northern Bakony (Fig. 1.). The Lókút section belongs to the so-called continuous, or basinal sequences, and the others (Somhegy-hill, Közöskút- and Kisnyerges-ravine) into the group of discontinuous, or "sea-mount" sequences.

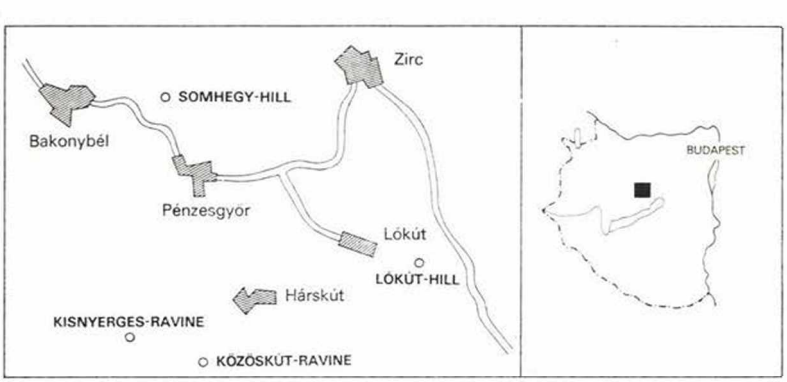

Fig. 1. Sketch-map of the locations of the studied Bajocian sections in the Northern Bakony

Study of the sections

Lókút

The Jurassic sequence of the Lókút-hill is well known from the Hungarian geological literature long before, but only the lower part, containing Liassic faunas have been treated so far.

The first to mention the locality of the Bajocian ammonites was Telegdi-Roth (1934, p. 217). On the basis of some listed ammo-

nites (*Phylloceras nillsoni* H é b., *Cadomites bayleanus* O p p., *Cadomites brodiaei* S o w.) he suggested the presence of the Middle Jurassic Stephanoceras humphriesianum Zone.

K o n d a (1970) reexamined the Middle Jurassic rocks of the area in detail, and on the basis of some newly collected ammonites (graphoceratids and stephanoceratids – determinations by B. G é c z y) he proved the Upper Aalenian and the Lower and Middle Bajocian.

From 1970, under the direction of J. K o n d a, a large-scale, layer by layer collection work started at the SW margin of the Lókút hill, SW of the original locality of K. T e l e g d i-R o t h. The excavated sequence and the extremely rich fauna made the clearing up of the stratigraphical and successional situation possible.

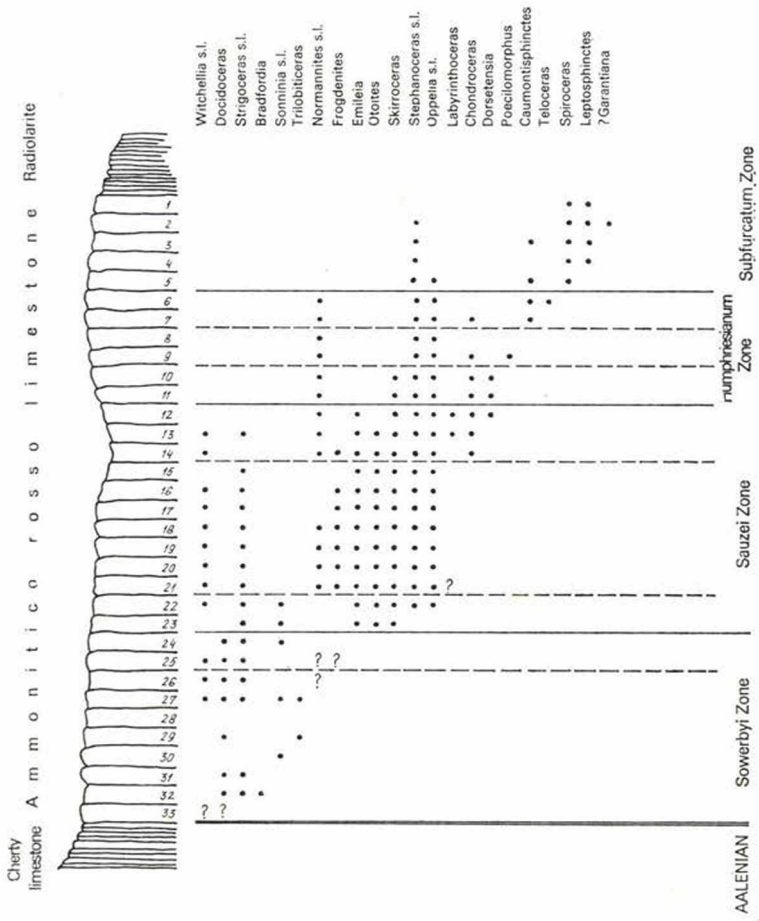

Fig. 2. The Bajocian sequence of the Lókút-hill locality, with the characteristic ammonite genera (in order of their appearance)

Succession

The uppermost part of the Liassic sequence forming the mass of SW portion of the Lókút hill is the so-called cherty, Paleotrix-Radiolaria-bearing limestone, lacking megafossils. It is the overlying rock of the Toarcian manganiferous sequence, therefore it is regarded conditionally as of Aaalenian (c.f. F ü l ö p et al. 1969, p. 59, Fig. 17; K o n d a 1970 p. 171, Fig. 2). The unfossiliferous cherty beds are overlain by the Bajocian ammonitic limestone in 6 m thickness. This limestone sequence is built up by irregularly alternating more marly and more calcareous beds. In the upper part of the section the lithological characters vary continuously, together with simultaneous faunal impoverishment. Above a few decimetre thick, transitional faunal-free group of layers, follows the Bathonian-Callovian radiolarite.

Fauna and zonation

The collection work from the 33 ammonitic beds yielded an enourmous material. Beside of the 16.465 (!) ammonite specimens, collected from a 19 m^2 surface on average, 10 nautiloids, about 400 belemnite rostra, 212 *Inoceramus* sp. and 31 *Anisocardia* sp. bivalves and 17 echinoid *(Orbignyana* spp.) occured.

The overwhelming majority of the ammonite fauna (about 85%) is constituted by phylloceratids and lytoceratids. In the stratigraphical evaluation, however, only the diagnostic Ammonitina are considered and tabulated (Fig. 2.). Taking the preliminary character of this paper into consideration, the determinations in the text and figures are confined to generic level.

S o n n i n i a s o w e r b y i Z o n e. The lower ten beds (Nos. 33 – 24.) of the section yielded a poor fauna suggesting the presence of the Sowerbyi Zone. Beside of some *Sonninia* and *Witchellia* specimens characteristic elements are the *Strigoceras*, *Bradfordia*, *Docidoceras* and *Trilobiticeras* species. The presence of *Trilobiticeras* was to be expected, because earlier, from the adjacent old section of T e l e g d i-R o t h a specimen of this genus was encountered (G a l á c z 1971).

In spite of the poor fauna the subdivision within this zone seems to be recognizable. The *Bradfordia* and *Trilobiticeras* specimens, characteristic to the lower, Discites Subzone, can be found in the lower beds (Nos. 33 – 26), while the upper beds, No. 25. and 24. yielded only some *Strigoceras* and *Sonninia* specimen. These latter two beds presumably represent the Laeviuscula Subzone.

O t o i t e s s a u z e i Z o n e. Going upwards in the Bajocian section of Lókút, the first *Otoites* and *Emileia* specimens occur in the Bed No. 23; conclusively the boundary of the Sowerbyi and Sauzei Zones is indicated between the Beds No. 24 and No. 23. The zonal index *Otoites* genus forms a gradually enriching group, but from Bed No. 20 upwards its species and specimen number decreases. The last, fragmentary *Otoites* sp. indet. specimen is yielded from the Bed No. 13.

The representatives of the genus *Emileia* from the Bed No. 23 up to the Bed No. 12 form a consistently very rich group. Additionally common forms are in the middle beds the species of the genus *Frogdenites* and in the upper part of the zone (Beds Nos. 13–12) the *Labyrinthoceras* species.

In the middle portion of the zone appear the stephanoceratids, with the genera *Stephanoceras*, *Skirroceras* and *Normannites* s. l.

In the lower part some late species of the characteristic Sowerbyi Zone genera *Sonninia* and *Witchellia* are also present. The first *Dorsetensia* species [*D. liostraca* Buckm., *D. deltafalcata* (Quenst.)] appear as early as the uppermost bed of this zone.

On the basis of this faunal sequence it is probable a threefold subzonal subdivision of the Sauzei Zone. Its lower part is characterized by the *Sonninia* and *Witchellia* species, the middle part by the abundant *Otoites*, *Frogdenites* and the earliest Stephanoceratidae, and the upper part by the *Labyrinthoceras* and the first *Dorsetensia* species.

Stephanoceras humphriesianum Zone. The lower boundary of the zone can be drawn at the base of the Bed No. 11, where the earlier'y dominant Otoitidae are replaced by the Stephanoceratidae. The great specimen and species number of the genera *Stephanoceras* and *Normannites* are characteristic throughout in the zone; the additional elements are the *Dorsetensia*, *Chondroceras* and oppeliid species. The upper boundary of the zone is recorded by the abrupt decline of the stephanoceratids between the beds Nos. 5. and 6.

The lower part of the Humphriesianum Zone is marked in the Lókút section by the genus *Dorsetensia*. In the middle part the massive appearance of the various *Stephanoceras* species and the enrichment of the *Chondroceras* is characteristic. It is interesting to note, that the single *Poecilomorphus* specimen came from the Bed No. 9, i.e. from the middle part of the zone. It can be regarded an extremely lucky found, because beside this specimen this bed yielded 1.235 other ammonites.

In the upper part of the Humphriesianum Zone characteristic elements are the *Teloceras* and the earliest representatives of the superfamily Perisphinctaceae. In these same beds are forms which can be regarded as transitions between the genera *Stephanoceras* and *Cadomites*. These forms survive into the Subfurcatum Zone. This is a group untreated so far, and comprises forms which were alternately determined as *Stephanoceras* or as *Cadomites*, but lacking the precise stratigraphical control, their exact systematic arrangement was uncertain. A presumably similar "*Cadomites*" fauna is that mentioned by Arkell (1965, p. 264.) from North Africa.

The Humphriesianum Zone of Lókút shows a threefold character. Similarly three subzones were recognized by Pavia and Sturani (1968) in the section of Digne (SE France). The lower, "Poecilomorphus" Subzone of these authors cannot be identified in the Lókút section, because the single *Poecilomorphus* specimen came from the middle part of the zone. On the other hand the middle, "Stephanoceras" Subzone of

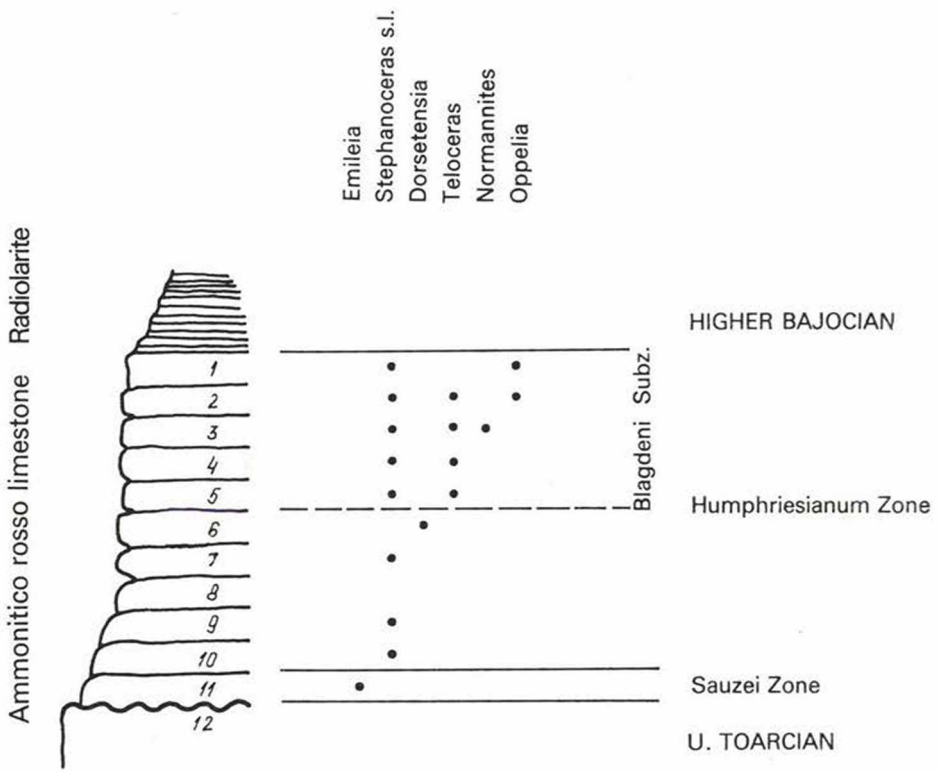

Fig. 3. The Bajocian section of the Közöskút-ravine, with the characteristic ammonite genera (in order of their appearance)

P a v i a and S t u r a n i is recognized at Lókút, on the basis of the rich *Stephanoceras* and *Normannites* fauna. The presence of the upper subzone of the Humphriesianum Zone is evidenced by the subzonal index *Teloceras blagdeni* (S o w.). This subzone comprises the Beds Nos. 7 and 6, where the earliest representatives of the perisphinctids (*Leptosphinctes* spp., *Caumontisphinctes* spp.) appear in relatively great specimen and species number. The beds characterized by similar fauna were placed by P a v i a (1971) into the lower Subfurcatum Zone. It seems more reasonable to drow the boundary of the Humphriesianum and Subfurcatum Zones with the disappearance of the genera *Stephanoceras*, *Normannites* and *Teloceras*, and to regard the earliest appearance of the perisphinctids within the Humphriesianum Zone, because the first representatives of the superfamily Perisphinctidae occur, outside of Europe, as early as in the Sauzei Zone (e.g. I m l a y 1973).

S t r e n o c e r a s s u b f u r c a t u m Z o n e. From the Bed No. 6. upwards – apart from the *Stephanoceras-Cadomites* transitions mentioned above – the number of the stephanoceratids diminishes comp-

letely. In the gradually poorer fauna besides the badly preserved *Leptosphinctes* and *Caumontisphinctes* species a few *Spiroceras* and in Bed No. 2 a single *Garantiana?* sp. indet. occur.

Owing to the poor state of preservation and small specimen number the subzonal-division cannot be traced.

Somhegy-hill

The Middle Jurassic of the Somhegy-hill, situated East of the village Bakonybél, on the northern side of the road to Pénzesgyőr, is well-known from the Hungarian geological literature. The first list of the ammonites collected from this locality was published by P a u l (1862, pp. 228 – 229). His determined species were as follows (with the probable modern names in brackets):

Ammonites ptychoicus Q u e n s t. (=*Ptychophylloceras* sp.)
A. Zignodianus d' O r b. (*Holcophylloceras* sp.)
A. Kudernatschi H a u. (*Phylloceras* sp.)
A. dimorphus d'O r b. [*Dimorphinites dimorphus* (d'O r b.)]
A. biplex S o w. (= ? *Leptosphinctes* sp.)
A. Achilles d'O r b. (= ? *Leptosphinctes* sp.)

As noted by P a u l, the phylloceratids („Heterophyllen") form the majority of the fauna.

In spite of this early contribution to the Middle Jurassic of the Somhegy-hill, this sequence remained unknown for the following geologists. S c h a f a r z i k (1890) studied a profile on the Somhegy-hill, but did not mention the Middle Jurassic rocks. T a e g e r (1912a, b) similarly missed these beds from his treaties.

During his revisions N o s z k y jun. (1943) found the Bajocian beds, and indicated the rich fauna. Beside of the Posidonomyas he mentioned *Phylloceras* spp. and *Sonninia*. From an other, hitherto unknown locality of the Somhegy-hill he recorded *Stephanoceras*, *Phylloceras*, *Sphaeroceras*, *Morphoceras* (=*Dimorphinites?*) and *Perisphinctes* (s. l.) genera, and *Spiroceras bifurcatum* Q u. and *Apsorroceras baculatum* Q u.

Recently K o n d a restudied the Jurassic sequence of the Somhegy-hill (1970, p. 187). In the neighbourhood of the point 649.6 m he excavated the Triassic-Jurassic rocks and recorded some ammonites, by the determinations of B. Géczy. These ammonites (*Stephanoceras* sp., *Nannolytoceras* sp., *Holcophylloceras mediterraneum* (N e u m.) and *Sphaeroceras* sp.) suggested the presence of the Upper Bajocian.

During the Mediterranean Jurassic Colloquium held in 1969 in Budapest, J. W e n d t examined the fauna, and preliminarly, without knowing the succession precisely, recognized as a fissure-infilling association (W e n d t 1971, p. 125).

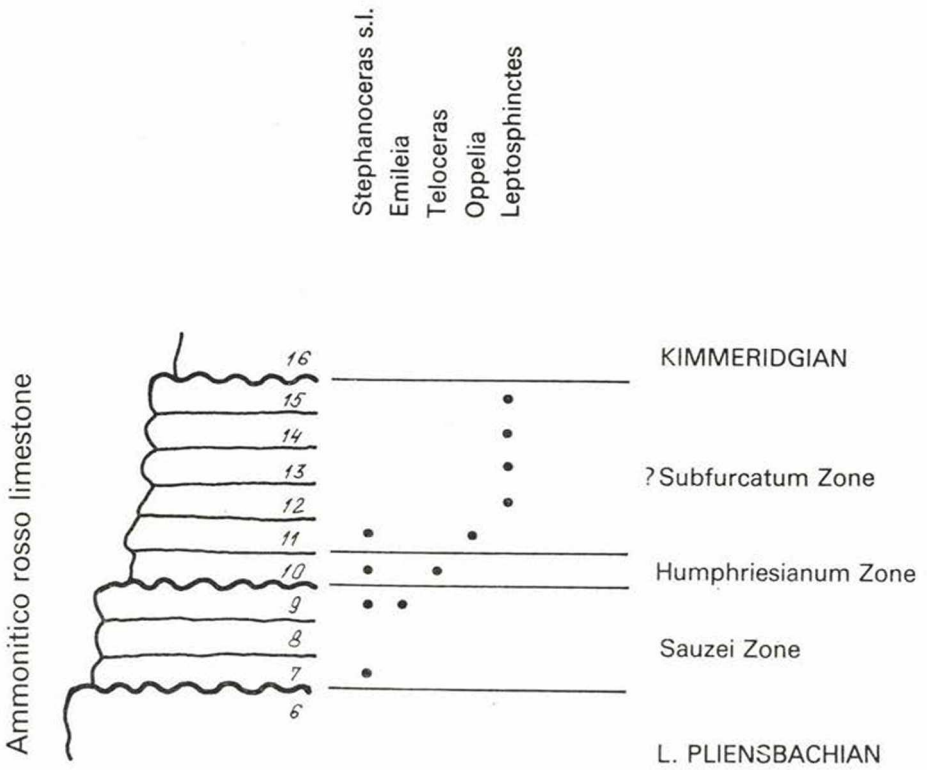

Fig. 4. The Bajocian section of the Kisnyerges-ravine, with the characteristic ammonite genera (in order of their appearance)

Succession

On the basis of the material collected under the direction of J. K o n d a from the excavation near the point 649.6 m on the Somhegy-hill, it was impossible to reconstruct the actual rock-succession. In the meantime the excavation was destructed and the exact location of the smaller faunal collections became unidentifiable.

During the field work for his graduate thesis geologist-student J. S z a b ó collected a large Middle Jurassic gastropod fauna, and by his studies, a part of the old collections can be evaluated.

According to the communications of K o n d a and S z a b ó the Lower Liassic limestone of Dachsteinkalk-type is overlain, on the Somhegy-hill, by the red, nodular, ammonitic Bajocian limestone. Within the Dachsteinkalk-type limestone there is a gradually attenuated fissure of about 60 cm in thickness, filled with reddish, manganiferous limestone, and yielding Bajocian fossils. Upon the red, nodular, ammonitic limestone rests the Kimmeridgian limestone, with *Aspido-*

ceras and other ammonites. This is, therefore, a highly condensed sequence, suggested not only by the stratigraphic record, but by the sedimentologic features, too (uneven, manganese-encrusted hard-ground of the Dachsteinkalk-type limestone, the fissure-infilling etc.).

Fauna and zonation

Within the red, nodular, ammonitic limestone overlying the Dachsteinkalk-type limestone, two Bajocian zones can be recognized (Fig. 5.). The ammonites yielded by the lower 3 beds are as follows:

Phylloceras sp.
Calliphylloceras sp.
Lytoceras sp.
Eurystomiceras polyhelictum (B ö c k h)
Oppelia sp.
Lissoceras semicostulatum B u c k m.
Stephanoceras spp.
Normannites spp.

Beside of the ammonites some *Inoceramus*, brachiopods, belemnites and echinoderms also occur.

This is a faunal association characteristic to the ammonitico rosso limestones, and suggests the middle Humphriesianum Zone. In the relatively rich group of ammonites the phylloceratids are in majority. These 3 beds is followed by a lithologically similar member, consisting of 5 beds, which contains a poorer fauna. The following ammonites were encountered:

Phylloceras sp.
Holcophylloceras mediterraneum (N e u m.)
Lytoceras sp.
Eurystomiceras polyhelictum (B ö c k h)
Dimorphinites dimorphus (d'O r b.)
Parkinsonia spp. indet.

In the lower bed (No. 5) the *Dimorphinites* is characteristic, while very poorly preserved *Parkinsonia* specimens came from this same (No. 5), and from the uppermost (No. 1) bed. On the basis of the presence of *Dimorphinites dimorphus* (d'O r b.) this upper five beds can be ranged into the upper part of the Parkinsoni Zone (c.f. G a l á c z 1970).

Between the lower three and the upper five beds a considerable hiatus can be recognized, which endures from the upper Humphriesianum up to the middle Parkinsoni Zone. The indicating of this missing record is represented in the fissure-infilling within the Dachsteinkalk-type limestone. This infilling yielded a very rich gastropod fauna, and an ammonite-assemblage, indicating the Subfurcatum and Garantiana Zones. The specimens are coated by manganese layers and are of excel-

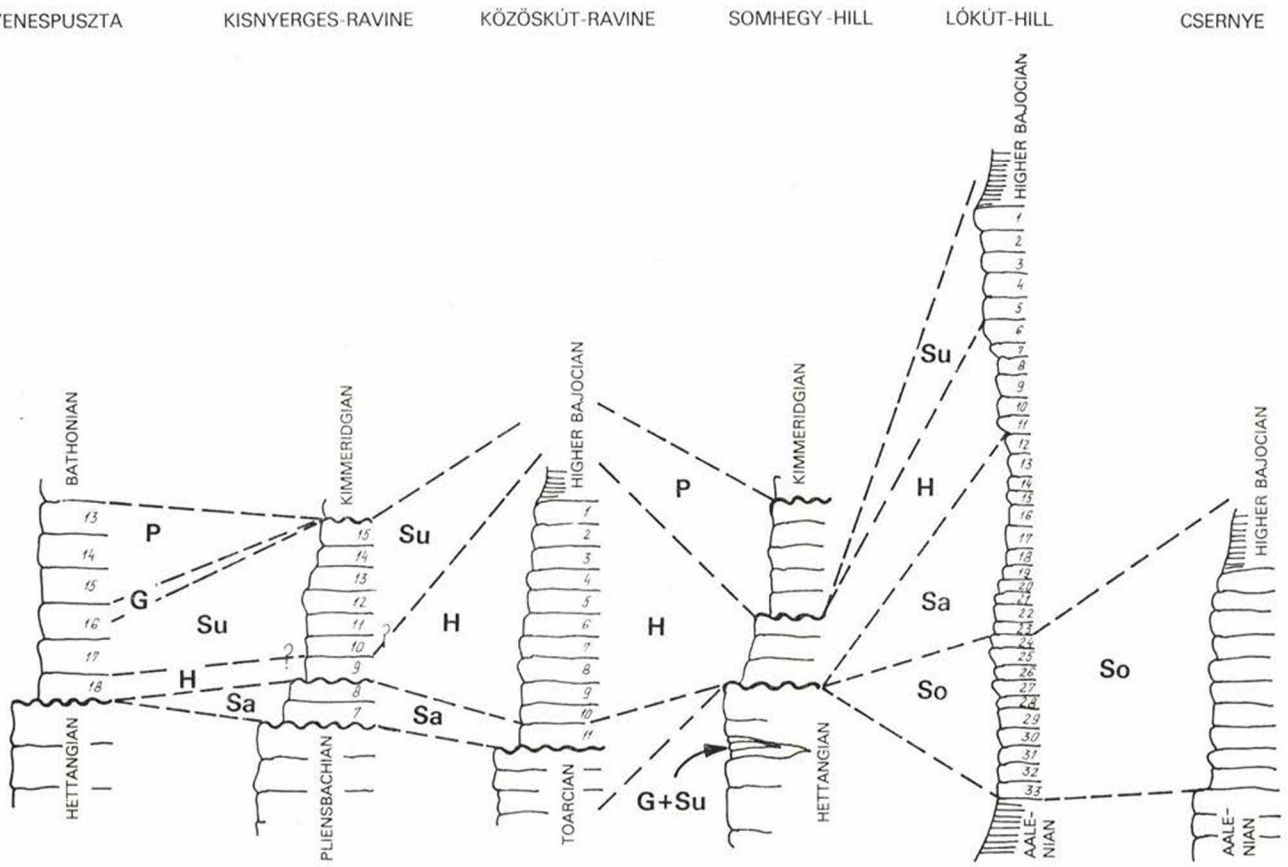

Fig. 5. Stratigraphical correlation of the Bajocian sections of the Northern Bakony (not to scale!)

lent preservation. The preparation from the matrix, however, is difficult, because under thin layer of manganese these specimens are filled with sparry calcite. The determinated forms are as follows:

Phylloceras sp.
Partschiceras sp.
Holcophylloceras sp.
Lytoceras sp.
Eurystomiceras polyhelictum (B ö c k h)
Oecotraustes (O.) genicularis W a a g e n
Sphaeroceras brongniarti (S o w.)
Sphaeroceras spp.
Spiroceras sp.
Garantiana sp. indet.

This fauna indicates the Subfurcatum and Garantiana Zones, but the answer to the question: whether it is a regular succession of the layers of the two zones, or a faunal mixture, needs a further, refined collection. In any case, the recognition of W e n d t (1971, p. 125) is proved: the condensed fauna contained in this "S-fissure" represents in part, or as a whole, the zones missing in the succession of the red nodular limestone. The fauna cannot regarded as a dwarfed fauna. It is constituted partly by specimens cf small-sized species *(Oecotraustes, Sphaeroceras, Eurystomiceras)*, and partly by young (wholly chambered) specimens of larger species *(Phylloceras, Lytoceras, Spiroceras)*.

Besides the ammonites the gastropods, bivalves and echinoderm-spines are abundant in the fauna. Further collections can make a detailed study on the whole fauna and the paleoecological conditions possible.

Közöskút-ravine

The Közöskút-ravine is a glen which runs SW about 2.5 km from the village Hárskút, bordering westerly the Borosthánhajag-hill.

The first to record the exposed Jurassic rocks of this locality was N o s z k y jun. (1943). He dealt with the Lower Jurassic sequence, and mentioned the presence of Middle Jurassic rocks. Later, in his 1:25.000 geological map of the Northern Bakony (1957) he recorded, besides the Liassic and Upper Jurassic, Dogger "Massive limestones" too. In his rewiew on the Jurassic rocks of Hungary (1961) also N o s z k y mentioned the Közöskút-ravine as one of the localities of the Aalenian-Bajocian manganese-nodulous, Cephalopod-bearing rocks and figured the outlined profile of this section.

In the Excursion Guide for the Mediterranean Jurassic Colloquium (F ü l ö p et al. 1969) a detailed profile demonstrated the locality, and the description presented the succession and the lithology. K o n d a

(1970) also treated this locality, and called the attention to the importance of this discontinuous sequence.

Recently a layer by layer collection work was made, which resulted a relatively rich material.

Succession

In the Közöskút-ravine, within the sequence exposed in the creek bed, the Upper Toarcian uppermost bed (No. 12) of the discontinuous Lower Jurassic is disconformably overlain by the Bajocian beds. The thickness of the 11 Middle Jurassic beds is 133 cm. The overlying rock of the red, nodular, ammonitic limestone is the Bathonian-Callovian radiolarite, but the boundary of the two different rock-type is unexposed in the section. On the other hand, by the oral communication of N o s z k y jun. it is expected that the section will yield limestone beds beneath the radiolarite with younger Bajocian, or Lower Bathonian faunas.

Fauna and zonation

In the Bajocian ammonite fauna of Közöskút-ravine, similarly as in the other Jurassic faunas from the Bakony Mountains, characteristic is the predominance of the phylloceratids and lytoceratids. Here these forms represent a 60% from the 271 Bajocian specimens. The additional faunal elements are subordinate, only a single *Inoceramus* sp. (Bed No. 10), a single nautilid (Bed. 11) and some belemnite fragments occur.

On the basis of the study of the stratigraphically diagnostic Ammonitina, two Bajocian zones can be recognized within the section (Fig. 3). The Bed. No. 11, i.e. the lowermost Bajocian layer yielded an extremely poor fauna, but the single *Emileia* sp. specimen certainly suggest the presence of the Otoites sauzei Zone.

The other beds (Nos. 10 – 1) seem to range into the Stephanoceras humphriesianum Zone, on the basis of the several species of the abundant *Stephanoceras* and *Normannites* genera. The threefold subdivision of the zone is untraceable here. The occurence of the *Teloceras* in the upper beds (Nos. 5 – 1) suggests the Teloceras blagdeni Subzone. The lower boundary of the subzone can be drawn between the Beds Nos. 6 and 5, because the large *Dorsetensia* sp. specimen yielded from the Bed No. 6 represents the middle Humphriesianum Zone. The subzonal arrangements of the lower beds are uncertain.

Kisnyerges-ravine

The Jurassic rocks of the Kisnyerges-ravine situated in the SE part of the Hajag Mountain-group (Northern Bakony) were firstly recorded by N o s z k y jun. (1953). Later on his geological map (1957) he figured Middle Dogger limestones in this area.

K o n d a (1970) gave a detailed description on the steeply dipping Liassic, Middle and Upper Jurassic rocks. From the red ammonitic limestones, overlying the Liassic rocks, he mentioned (in the preliminary determination of B. G é c z y) a *Stephanoceras* sp. specimen.

In the years 1970 – 71 a detailed layer by layer collection work was carried out by the Geological Survey of Hungary, and this work resulted in a relatively rich fauna.

Succession

In the steeply dipping sequence of the Kisnyerges-ravine the oldest rock is the Lower Liassic limestone of Dachsteinkalk-type. Upon its uneven surface disconformably lies the massive ammonitico rosso limestone. The lower 6 beds of 88 cm thickness form a discontinuous Upper Sinemurian and Pliensbachian sequence. It is disconformably overlain by the 173 cm thick Bajocian limestone, represented in the Beds Nos. 9 – 15. From the Bajocian zones the Otoites sauzei and the Stephanoceras humphriesianum were undoubtedly, and the Strenoceras subfurcatum Zone was uncertainly proved. The interest of this markedly discontinuous sequence is that it lacks the radiolarite, i.e. the Bajocian is followed by Kimmeridgian, *Aspidoceras*-bearing limestones.

Fauna and zonation

The evaluation of the Bajocian fauna from the Kisnyerges-ravine is encumbered by the poor state of preservation and the low specimen number as well.

The beds collected from 3,4 m^2 average surface yielded 97 ammonite specimens altogether. The additional fauna is represented merely by a single brachiopod specimen (Bed No. 9) and some belemnite rostra.

It is proved on the basis of the ammonites, that the sequence shows hiatuses within the Bajocian too, since only portions of the certain zones are represented (Fig. 4).

The majority of the fauna is consisted of phylloceratids and lytoceratids. From the stratigrafically important Ammonitina the most common forms are the *Stephanoceras* species. On the basis of the *Emileia* sp. occured in the Bed No. 9 the lower three beds (Nos. 7 – 9) can be ranged into the Otoites sauzei Zone.

In addition to the *Stephanoceras* spp., the Bed No. 10 yielded a *Teloceras*, which shows the presence of the upper subzone of the Humphriesianum Zone. From the Bed No. 13 upwards appear the Bajocian perisphinctids, suggesting the Subfurcatum Zone. The precise determination of these poorly preserved *Leptosphinctes*-allies is impossible, hence to drow the upper boundary of the Humphriesianum Zone is uncertain.

Conclusions

The most complete Bajocian sequence of the sections studied from the Northern Bakony is of the Lókút-hill locality. The extremely rich ammonite fauna giving the base for the zonal and subzonal subdivisioning is of international interest, in the points of view of paleogeography, evolution and stratigraphy.

The other, markedly discontinuous sections can be correlated with the previously studied Bajocian profiles of Gyenespuszta (Galácz 1970) and Csernye (Géczy 1967a,b), (Fig. 5.).

In the Bajocian sections of the Bakony Mountains the greatest areal distribution is shown by the Humphriesianum Zone, while the Lower and Upper Bajocian zones are frequently unrepresented.

The Mediterranean type ammonite faunas can be correlated with those of NW Europe; however the further studies are hopeful, in the point of view of the Mediterranean Bajocian stratigraphy.

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